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Kommer

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(54) **LIFTING OR LOCKING SYSTEM AND METHOD**

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(51) **Int. Cl.**
B66D 3/04 (2006.01)

(52) **U.S. Cl.**
USPC **254/391**; 254/408

(58) **Field of Classification Search**
USPC 254/394, 391, 408, 393, 397, 398, 399
See application file for complete search history.

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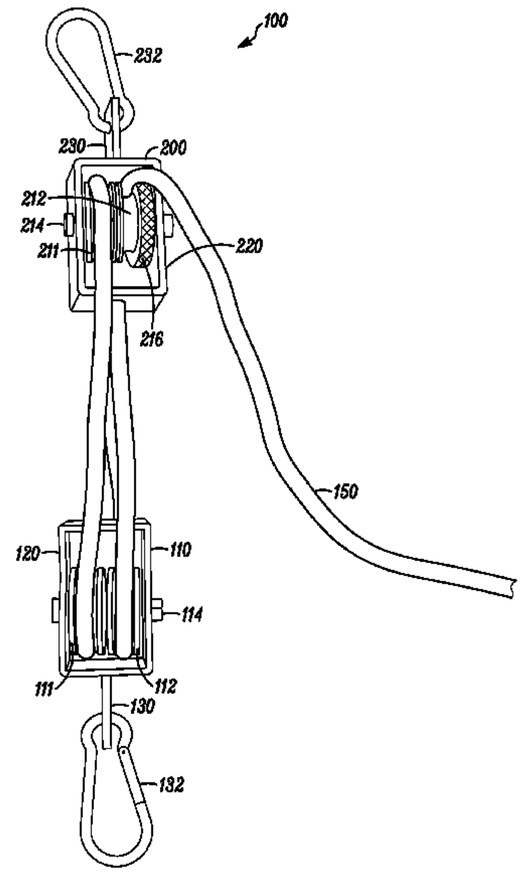
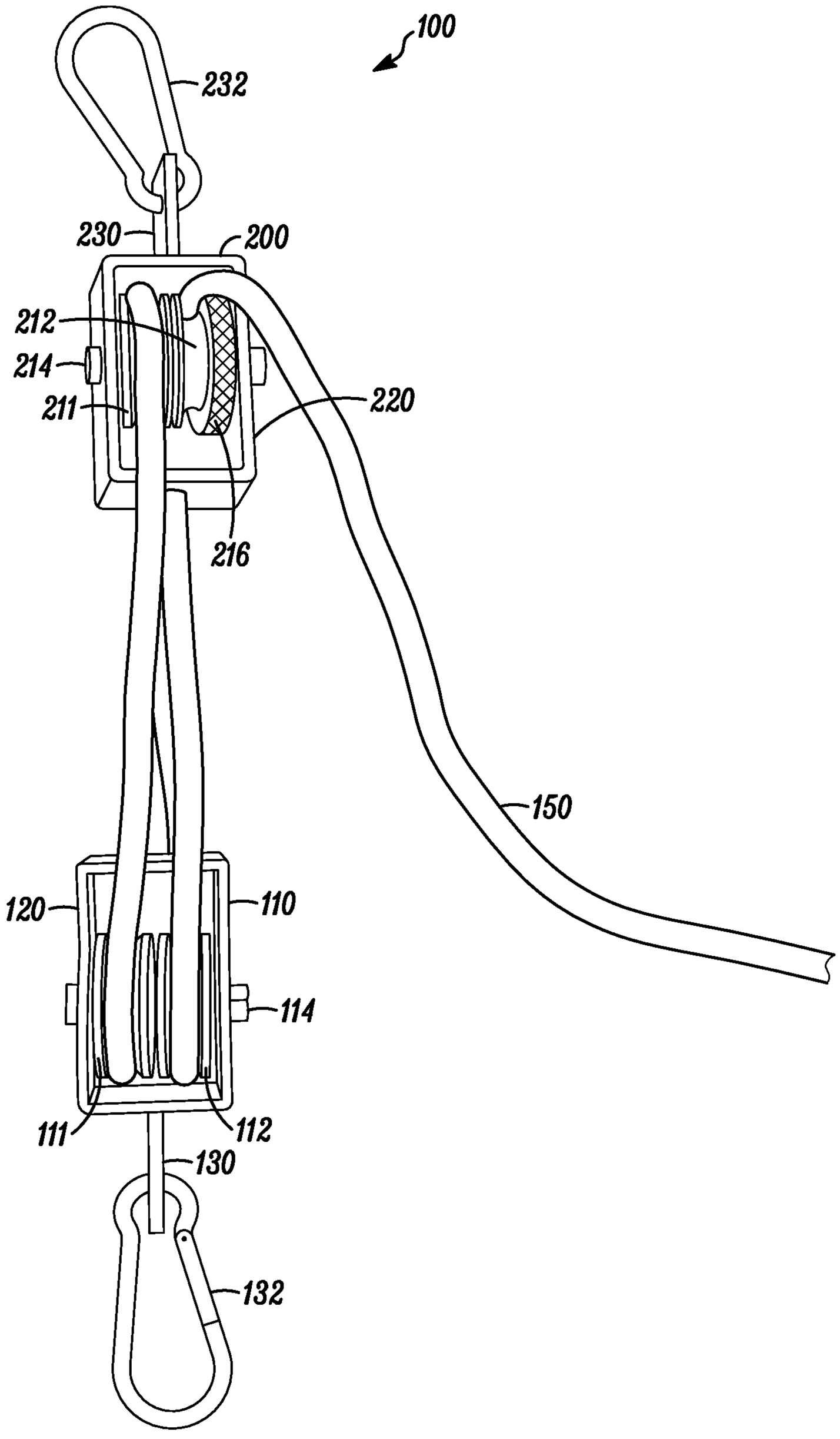
(57) **ABSTRACT**

A lifting mechanism or locking mechanism includes a housing, an axle attached to the housing, and an element including a cam surface mounted for rotation on the axle. The distance between the cam surface and the housing changes between a maximum clearance distance and a minimum clearance distance as the element rotates about the axle. The lifting mechanism also includes a line which can be moved between a first position over the cam surface and a second position.

18 Claims, 8 Drawing Sheets

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200
212
214
211
220
216
150
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114
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130
132

FIG. 1

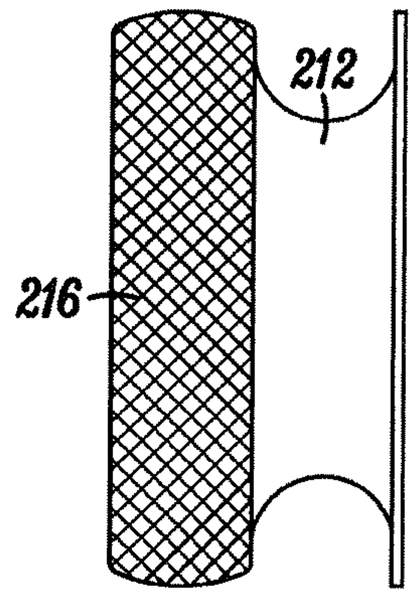

FIG. 2A

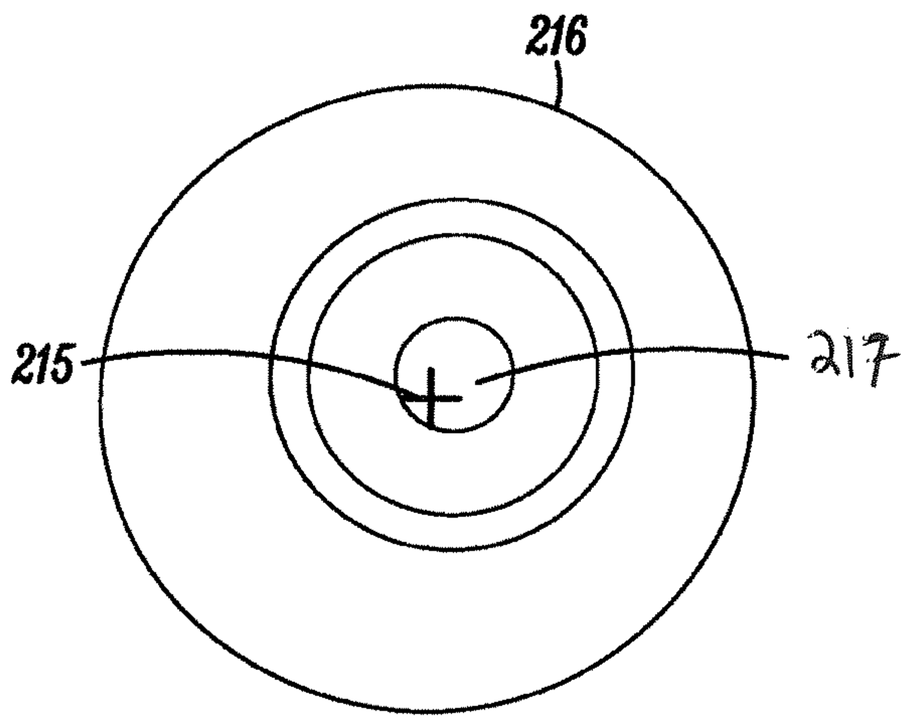

FIG. 2B

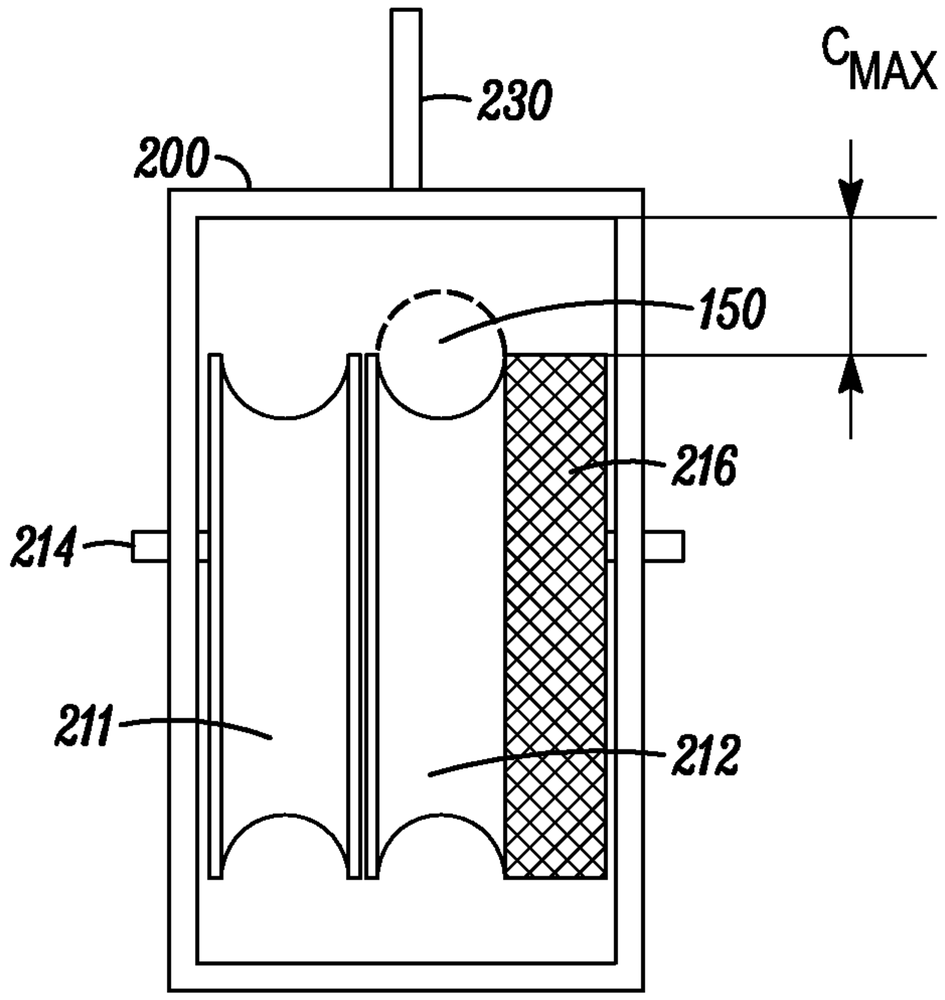
230
C_{MAX}
200
150
216
214
211
212

FIG. 3A

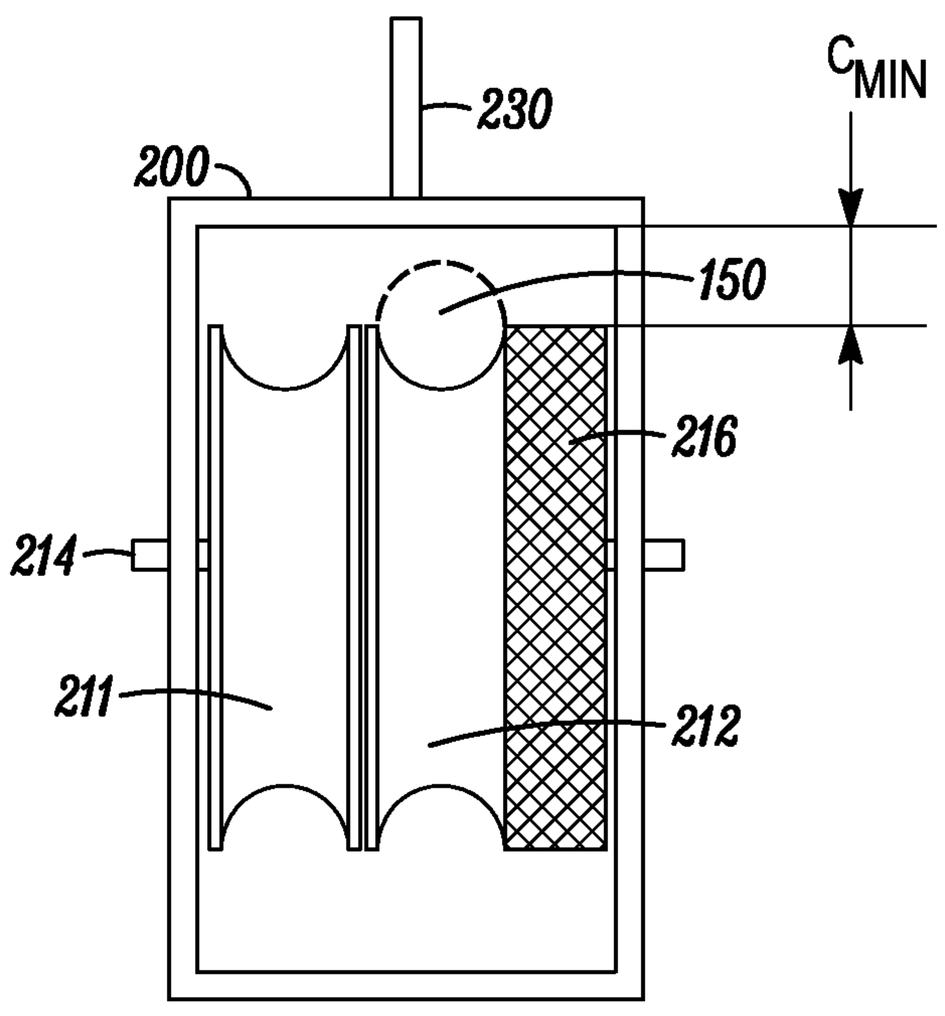
230
C_{MIN}
200
150
216
214
211
212

FIG. 3B

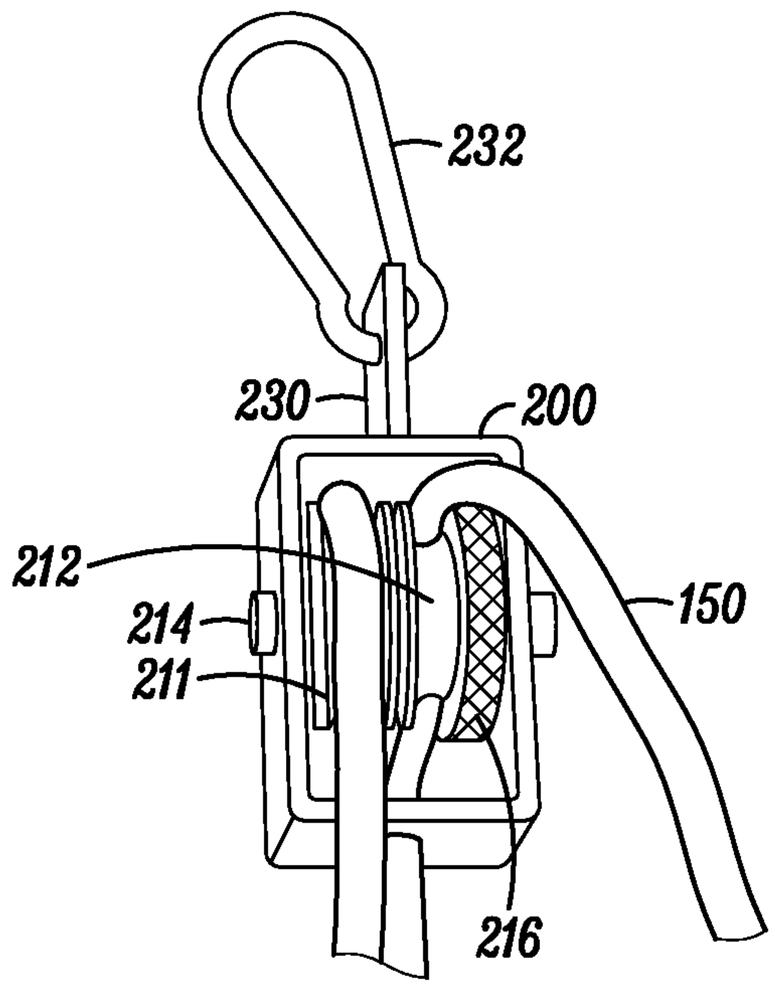

FIG. 4

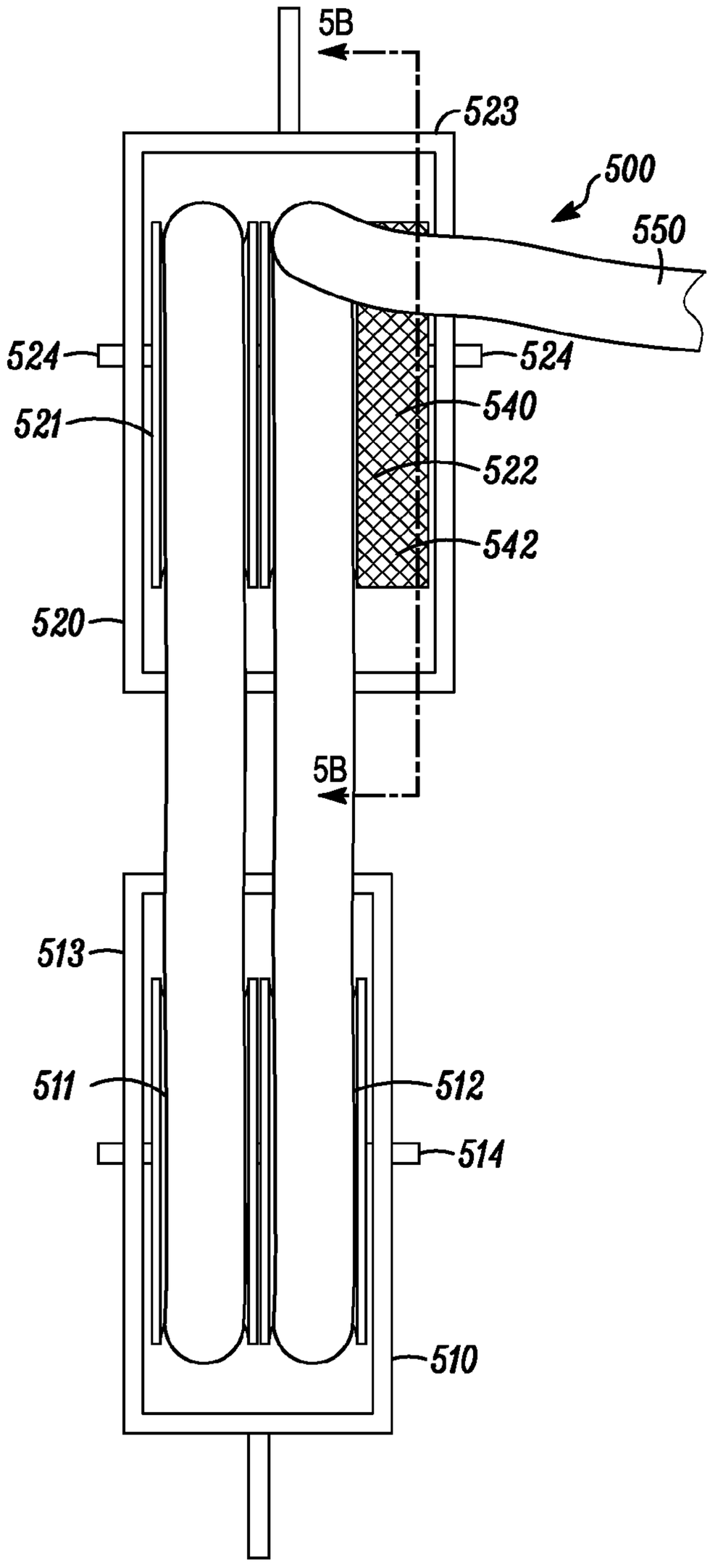
5B
523
500
550
524
524
521
540
522
542
520
5B
513
511
512
514
510

FIG. 5A

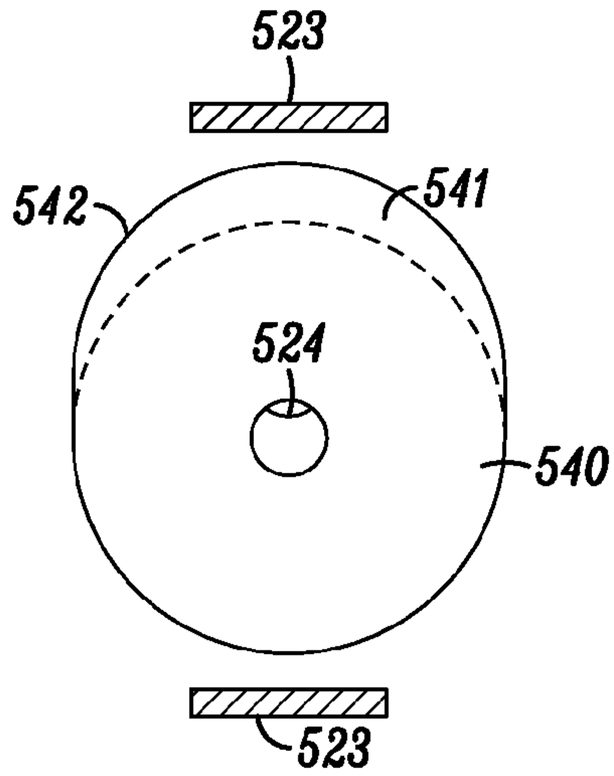
523
542
541
524
540
523

FIG. 5B

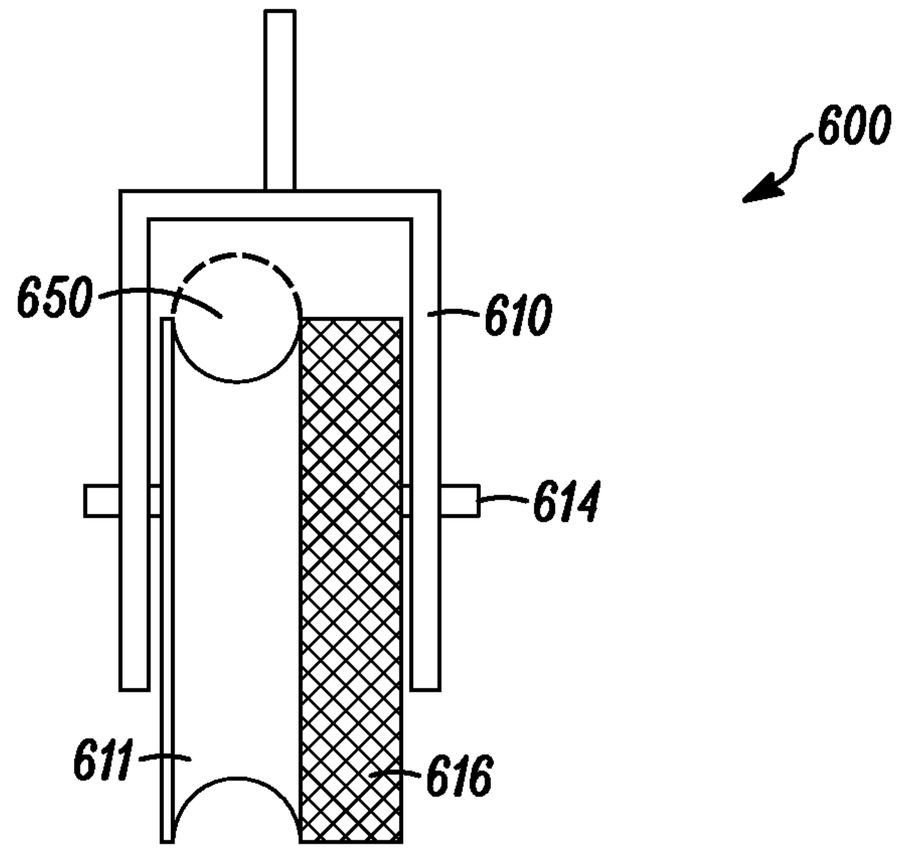

FIG. 6

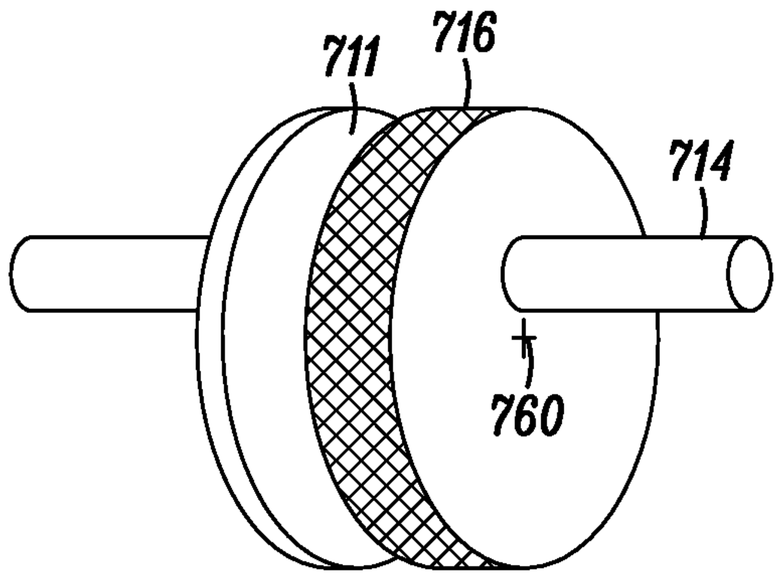

FIG. 7

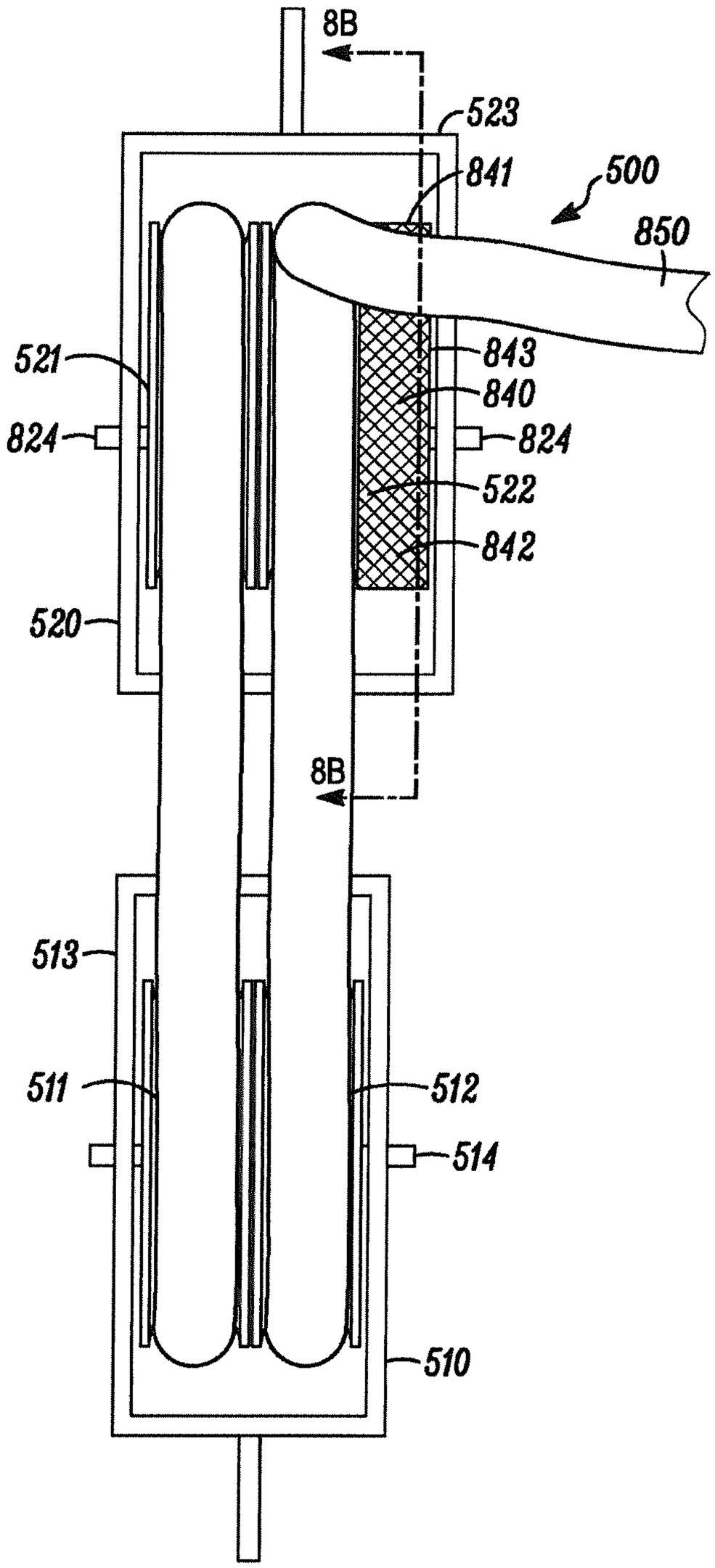
8B
523
841
500
850
521
843
840
824
824
522
842
520
8B
513
511
512
514
510

FIG. 8A

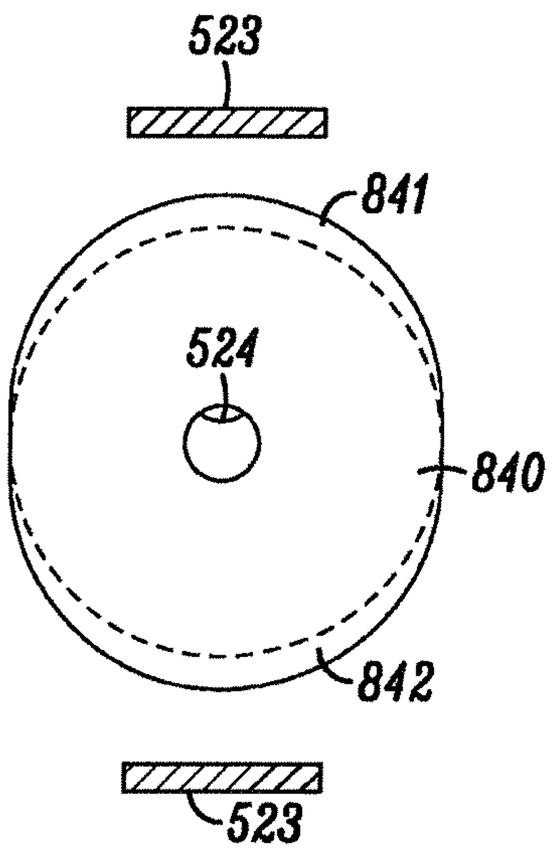
523
841
524
840
842
523

FIG. 8B

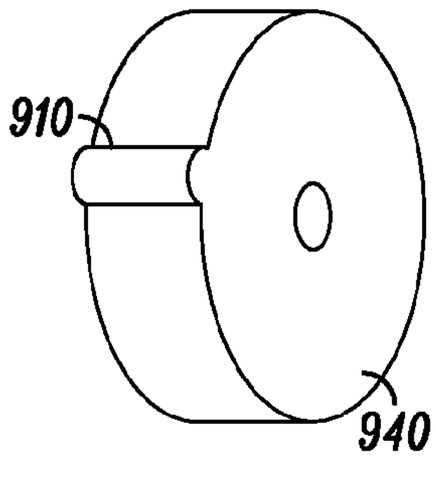

FIG. 9A

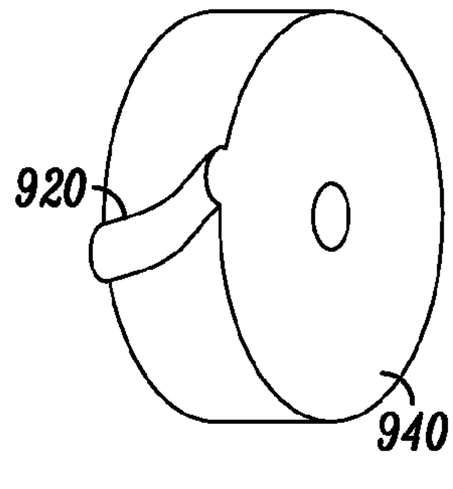

FIG. 9B

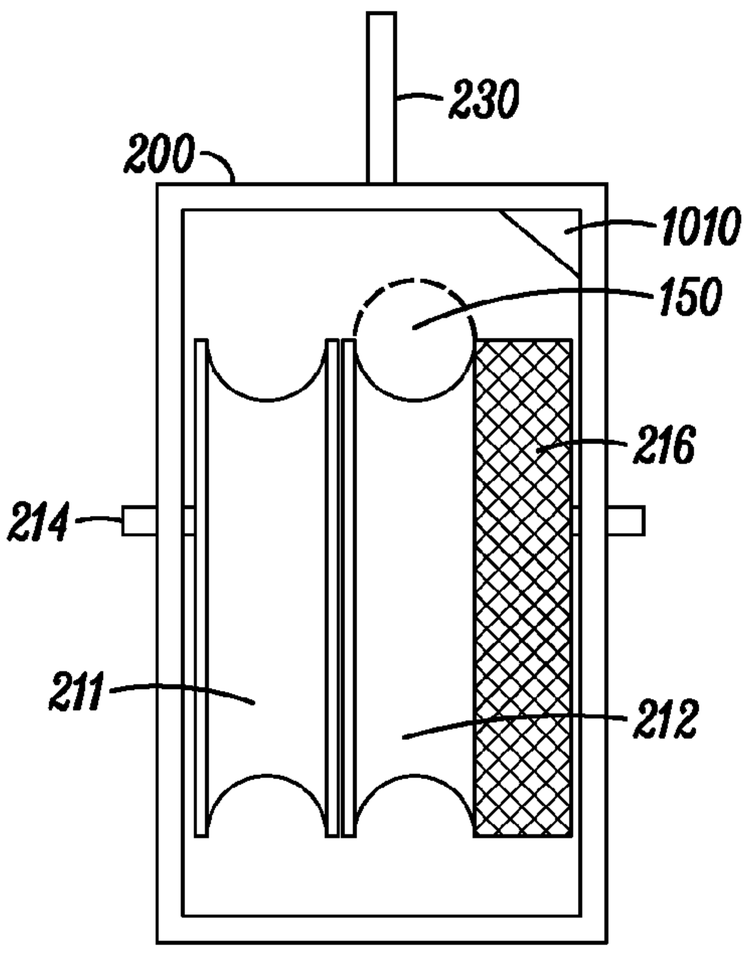

FIG. 10A

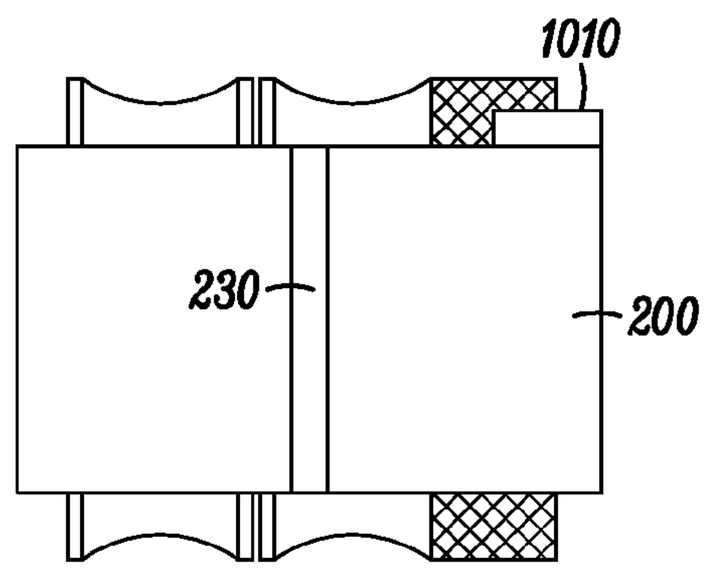

FIG. 10B

LIFTING OR LOCKING SYSTEM AND METHOD

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of U.S. patent application Ser. No. 13/587,584, filed Aug. 16, 2012, which claims the benefit of U.S. Provisional Application No. 61/525,554, filed Aug. 19, 2011, both of which applications are incorporated herein by reference.

FIELD

Various embodiments described herein relate to a lifting or locking system and a method.

BACKGROUND

Lifting systems are needed for many applications. Outdoorsmen frequently use lifting systems. Hunters lift deer and other big game as part of the butchering process. Campers that camp in areas with bears, hoist a bear bag with all their smellables from a high branch on a tree. This prevents bears from coming into camp. There are other uses of lifting systems such as for hoisting bikes or canoes up to the ceiling of a garage for storage purposes. These are but a few example uses.

Currently, ropes must be tied off while the heavy load is held up. For example, when hoisting a bear bag, the rope is wrapped around the tree to slow or prevent slippage. The rope is then tied off to another tree while still being held taut. It is difficult to hold a rope taut while tying it off. If the job is not done correctly, there are consequences. The load or object being hoisted may come crashing down which endangers others and which can damage the object being hoisted.

SUMMARY

The invention includes a lifting or locking mechanism that includes a housing, an axle attached to the housing, and an element including a cam surface mounted for rotation on the axle. The distance between the cam surface and the housing changes between a maximum clearance distance and a minimum clearance distance as the element rotates about the axle. The lifting or locking mechanism also includes a line which can be moved between a first position over the cam surface and a second position. In one embodiment, the cam surface includes a surface treatment for increasing an amount of friction at the cam surface. In another embodiment, the cam surface is associated with a cam and in still another embodiment, the cam surface is associated with a round element that includes an off center opening. The round element is rotatably mounted to the axis via the off center opening. In still a further embodiment, the lifting mechanism also includes a sheave mounted to the axle. The cam surface and the sheave can be formed from a single piece of material. The cam surface and the sheave can also be separate elements. In one embodiment, the line is in the second position when it is positioned within the sheave. The lifting or locking mechanism, in one embodiment, is made from a metal.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a lift system in use, according to an example embodiment.

FIG. **2**A shows a top view of the pulley or sheave with the widened end that includes the knurled surface, according to an example embodiment.

FIG. **2**B shows a side view of the pulley or sheave, according to an example embodiment.

FIG. **3**A is a close up view of the fixed block and more particularly a first position of the pulley or sheave with respect to the housing of the fixed block, according to an example embodiment.

FIG. **3**B is a close up view of the fixed block and more particularly a second position of the pulley or sheave with respect to the housing of the fixed block, according to an example embodiment.

FIG. **4** shows the fixed block when the cord or line is pinched or held between the fixed housing and the widened surface, according to an example embodiment.

FIG. **5**A shows another embodiment of a block and tackle.

FIG. **5**B shows a cross sectional view of the fixed block along line **5**B-**5**B in FIG. **5**A, according to an example embodiment.

FIG. **6** shows a pulley that incorporates the invention, according to an example embodiment.

FIG. **7** shows a pulley or sheave with an axle attached at a location offset from a central axis, according to an example embodiment.

FIG. **8**A shows another embodiment of the block and tackle, according to an embodiment of this invention.

FIG. **8**B shows a cross sectional view of the fixed block along line **8**B-**8**B in FIG. **8**A, according to an example embodiment.

FIG. **9**A shows different type of lobe associated with a cam, according to an example embodiment.

FIG. **9**B shows another different type of lobe associated with a cam, according to an example embodiment.

FIG. **10**A is a close up view of the fixed block and more particularly the pulley or sheave and the fixed block, according to another example embodiment.

FIG. **10**B is a top view of the fixed block shown in FIG. **10**A, according to another example embodiment.

DETAILED DESCRIPTION

FIG. **1** is a top view of a block and tackle **100** that includes the invention, according to an example embodiment. The block and tackle **100** includes a moving block **110** and a fixed block **200**. The moving block **110** includes a set of pulleys **111**, **112** (also known as sheaves) rotatably mounted on a single axle **114**. The axle **114** is mounted to a moving block housing **120**. The moving block housing also includes an attachment point **130**. In the example shown, a carbineer **132** is attached to the attachment point **130**. A load or item that is to be moved is attached to the carbineer **132**.

The fixed block **200** also includes a set of pulleys **211**, **212** which are rotatably mounted to an axle **214**. The axle **214** is attached to a fixed block housing **220**. The pulley **212** includes a widened edge **216** which, when assembled, is placed close to the side of the fixed block housing **220**. In the embodiment shown, the widened edge **216** of the pulley or sheave **212** is knurled so as to provide additional friction on the widened edge **216**. The fixed block housing **220** is slightly wider than the moving block housing **120** so as to accommodate the widened edge **216** of the pulley **212**. The fixed block housing **220** also has an attachment point **230**. A carbineer **232** is attached to the fixed block attachment point. One end of a line **150** is attached to the fixed block housing **220**. The line is threaded though the pulley **111**, the pulley **211**, the pulley **112**, and the pulley **212**. A free end of the line **150**

leaves the pulley or sheave **212**. A pulling force can be placed on the line **150** so as to move the moving block **110** with respect to the fixed block **200**. The line **150** substantially completes the block and tackle **110**.

The pulley **212** or set of pulleys **211**, **212** in the above block and tackle **100** are modified. The pulley **212** includes the widened edge **216** with the knurled portion **216**. FIG. **2**A shows a top view of the pulley or sheave **212** with the widened end **216** that includes the knurled surface, according to an example embodiment. FIG. **2**B shows a side view of the pulley or sheave **212**, according to an example embodiment. FIG. **2**B shows that the opening **217** for the axle is offset or off center from a central axis **215** of the pulley **212**. The opening **217** is eccentric. As the pulley **212** rotates about the axle **214**, the distance between the perimeter of the sheave or pulley **212** and the housing **230** varies. The amount of variance is continuous and equates to simple harmonic motion.

FIGS. **3**A and **3**B are close up views of the fixed block **200** and more particularly the pulley or sheave **212** and the fixed block **200**, according to an example embodiment. The axis **214** on which the sheave or pulley **212** rotates is offset from the center of the pulley or sheave **212**. FIG. **3**A shows the maximum distance between the sheave or pulley **212** and the fixed block **200** as the pulley **212** rotates about the axle **214**, according to an example embodiment. This clearance distance is maximum, C_{max}, occurs once every rotation of the sheave **212**. It should be noted that the clearance distance is also at its maximum with respect to the widened surface **216** of the sheave **212**. In this particular embodiment, the sheave or pulley **211** has an offset opening similarly positioned to the offset opening of the sheave or pulley **212**. As a result, it too is at a maximum clearance distance, C_{max}, from the fixed housing **200**. It should be understood that in another embodiment, the sheave **211** could be provided with a center opening on which the sheave or pulley **211** would rotate.

FIG. **3**B shows the minimum clearance C_{min}, distance between the sheave or pulley **212** and the fixed block **200**. This also occurs once during the rotation of the pulley or sheave **212**. This position occurs after about half a rotation or after the sheave or pulley **212** rotates through about 180 degrees of rotation. The widened edge **216** of the pulley or sheave is at the periphery of the sheave or pulley and is also at a minimum clearance distance, C_{min}. It should be noted that the cord or line **150** has a diameter, d, which is greater than the minimum clearance distance, C_{min}. The sheave or pulley **211** has an opening that is offset by about the same distance as the sheave **212** so it too is at the minimum clearance distance.

When the pulleys **211**, **212** are offset the motion corresponds to a simple harmonic motion that is related to the offset of the pulleys **211**, **212** from rotation about the center of the pulley **212** or pulleys **211**, **212**. As the pulley rotates it passes a maximum clearance distance, C_{max}, and a minimum clearance distance C_{min}, between the pulley **212** or pulleys **211**, **212** and the housing **200**. The cord or line **150** has a diameter, d, which is larger than the minimum clearance distance C_{min}.

FIG. **4** shows the fixed block **200** when the cord or line **150** is pinched or held between the fixed housing **200** and the widened surface **216**, according to an example embodiment. The axel **214** is placed so that the sheave or pulley **212** can rotate freely when the cord or line **150** is positioned within the sheave **212** and so that the dimension C_{min} is less than the cross-sectional diameter of the cord or line **150**. In operation, the cord or line **150** is used to hoist a load as it would be in a block and tackle, such as block and tackle **100**. When the load is at a desired position the user merely moves the cord or line to the side of the sheave or pulley **212**. The cord or line **150** is positioned so that it crosses the widened portion **216** of the pulley **212**. The load is then released or let down slightly with the cord or line **150**. The cord or line **150** has a diameter which is larger than C_{min} (shown in FIG. **3**B) so the cord is caught or pinched between the housing **200** of the fixed block and the widened edge **216**. The knurling on the widened edge **216** increases the friction between the cord or line **150** and the widened edge **216**. This prevents or substantially curtails the cord or line **150** from slipping over the widened edge **216**. When the pulley or sheave approaches C_{min} as it rotates, the line **150** is captured between the widened edge **216** and the housing **200**. Adding more weight to the load on the moving block **110** results in further wedging the line or cord **150** into the space between the widened edge **216** and the housing **200**. When the spacing is correct, the line or cord **150** eventually catches and stops as it is pinched between the widened edge **216** and the top of the housing **200** where C_{min} occurs. When pinched, the load is held in position by the line **150**. The line **150** does not move since it is wedged between the widened edge and the housing. To release the line **150**, the line is pulled in the other direction away from the widened edge **216** and toward the sheave **212**. The free end of the line **150** is pulled and the line **150** is dislodged and repositioned in the sheave or pulley **212**. The block and tackle **100** can then be used to move the load.

In one embodiment, the sheaves or pulleys **211**, **212** are both off center while the sheaves or pulleys **111**, **112** are centered. In still another embodiment, the sheaves or pulleys **111**, **112**, **211** are all centered and the sheave **212** is off center. When the sheave **212** is off center, the sheave produces an eccentric motion like a cam.

FIG. **5**A shows another embodiment of the block and tackle **500**, according to an embodiment of this invention. FIG. **5**B shows a cross sectional view of the fixed block along line **5**B-**5**B in FIG. **5**A, according to an example embodiment. Referring to both FIGS. **5**A and **5**B, the block and tackle **500** will be further detailed. The block and tackle **500** includes a moving block **510** that includes a sheave **511** and a sheave **512**. The moving block **510** also includes a housing **513**. Attached to the housing **513** is an axle **514**. The block and tackle **500** also includes a fixed block **520** that includes a sheave **521** and a sheave **522**. The fixed block **520** also includes a housing **523**. Attached to the housing **523** is an axle **524**. The sheaves **511**, **512**, **521**, and **522** all include centered openings on which to rotate. Sheaves **511**, **512** rotate on axle **514** of the moving block. Sheaves **521**, **522** rotate on axle **524** of the fixed block **520**. Also attached to the axle **524** of the fixed block housing **523** is a cam **540**. The cam **540** is positioned adjacent the sheave **522**. The cam **540** includes a lobe **541** that passes nearer to the housing **523** than the sheave **522** or nearer to the housing **523** than the other parts of the cam **540** as it rotates on axle **524**. In one embodiment, the cam is attached to the sheave **522**. In another embodiment, the cam **540** is attached to the axle **524**. In still another embodiment, the cam **540** is keyed to the axle **524**. In still another embodiment, the axle **524** can have a flat portion and the cam **540** can be provided with a set screw to tighten to the flat.

The surface **542** associated with the outer perimeter of the cam **540** can also be treated to increase friction, such as by knurling the surface. The surface **542** can also be treated in other ways to roughen the surface **542** which in turn enhances the gripping ability of the cam **540**. The cam **540** can be made of metal or another material. The block and tackle **500** is completed by attaching a line **550** to the fixed block **520** or the moving block **510** and threading the line **550** through the

sheave **511**, sheave **521**, sheave **512** and sheave **522**. The free end of the line can be pulled to move a load attached to the moving block **510**.

During operation, the cord or line **550** is used to hoist a load as it would be in a block and tackle, such as block and tackle **500**. When the load is at a desired position the user merely moves the cord or line to the side of the sheave or pulley **522** to a position crossing the outer surface **542** of the cam **540**. The load is then released or let down slightly with the cord or line **550**. The cord or line **550** has a diameter which is larger than the minimum distance between the lobe **541** of the cam **540** and the fixed housing **523** so the cord is caught or pinched between the housing **523** of the fixed block **520** and the edge **542** at the outer perimeter of the cam **540**. The knurling on the widened edge **542** increases the friction between the cord or line **550** and the edge **542**. The cam **540** has a thickness to allow the edge **542** to pinch or grip the line **550**. This prevents or substantially curtails the cord or line **550** from slipping over the edge **542**. When the cam **540** approaches the minimum clearance point (corresponding to the lobe **541** passing the housing **523**) as it rotates, the line **550** is captured between the cam **540** edge **542** and the housing **523**. Adding more weight to the load on the moving block **510** results in increased wedging of the line or cord **550** into the space between the surface **542** of the cam **540** and the housing **523**. When pinched, the load is held in position by the line **550**. The line **550** does not move since it is wedged between the surface **542** and the housing **523**. To release the load, the line **550** is pulled in the other direction away from the edge **542** of the cam **540** and toward the sheave **522**. The free end of the line **550** is pulled and the line **550** is dislodged and repositioned in the sheave or pulley **522**. The block and tackle **500** can then be used to move the load.

In another embodiment, the cam **540** can be replaced with a disk having a opening therein that is off center so that it presents an eccentric motion as it rotates. The perimeter of the disk can be roughened or treated to increase friction. The disk can be attached to sheave **522** or attached to the shaft **524** as discussed above. In short, the eccentric disk would replace the cam **540** with its lobe **541**. It could be attached to the shaft or axle **524** in any way, including the ways mentioned above with respect to the cam **540**.

FIG. **8**A shows another embodiment of the block and tackle **800**, according to an embodiment of this invention. FIG. **8**B shows a cross sectional view of the fixed block along line **8**B-**8**B in FIG. **8**A, according to an example embodiment. Referring to both FIGS. **8**A and **8**B, the block and tackle **800** will be further detailed. The block and tackle **800** is similar to the block and tackle **500** shown in FIGS. **5**A and **5**B and discussed above. Many of the components of the block and tackle **800** are the same as the block and tackle **800**. Rather than describe the entire block and tackle **800** in detail, the different portions of the block and tackle when compared to the block and tackle **500** will be detailed. One difference is that the cam **840** is multi-lobed. In other words, the cam **840** includes two or more lobes. In the embodiment shown, there are two lobes **841** and **842**. It should be understood that there may be three lobes, four lobes or even more. The axle **824** can be located substantially equidistant between the lobes, such as lobes **841**, **842**. In another embodiment, the axle can be located at two different distances from the axle. The cam **840** can have an opening therein so that the cam rotates on the axle. In another embodiment, the axle can be affixed to the cam **840** so that the axle **824** rotates with respect to the opening in the housing of the fixed block.

The surface **843** associated with the outer perimeter of the cam **840** can also be treated to increase friction, such as by knurling the surface. The surface **843** can also be treated in other ways to roughen the surface **543** which in turns enhances the gripping ability of the cam **840**. The cam **840** can be made of metal or another material. The block and tackle **800** is completed by attaching a line **850** to the fixed block **520** or the moving block **510** and threading the line **850** through the sheave **511**, sheave **521**, sheave **512** and sheave **522**. The free end of the line can be pulled to move a load attached to the moving block **510**.

In operation, the line **850** could catch or be pinched near or at lobe **841** or near or at lobe **842**. When the cam is bigger in diameter for heavy duty operation, the line will catch or be pinched within half a rotation. The more lobes in the multi-lobed cam, the less movement needed before the line will catch. Of course, the number of lobes needs to be balanced with the diameter of the cam **840**. At some point, the number of lobes becomes too numerous such that the line **850** cannot be moved to a position on the cam surface **843** without being hindered by another lobe.

FIGS. **9**A and **9**B show different type of lobe associated with a cam **940**, according to an example embodiment. In FIGS. **9**A and **9**B, the lobe is a raised feature on a substantially round disk having about the same diameter as the sheaves associated with a block and tackle or a pulley system. FIG. **9**A shows a raised feature **910** that traverses the surface of the cam **940**. FIG. **9**B shows another raised feature **920** that traverses the surface of the cam **940**. The raised feature **910**, **920** pinches the line between the raised feature **910**, **920** and a housing holding the cam **940**, when the line is moved to a position on the surface of the cam **940**. Of course, a cam **940** can be provided with a plurality of raised features **910**, **920**.

FIG. **10**A is a close up view of the fixed block **200** and more particularly the pulley or sheave **212** and the fixed block **200**, according to another example embodiment. FIG. **10**B is a top view of the fixed block **200** shown in FIG. **10**A. The axis **214** on which the sheave or pulley **212** rotates is offset from the center of the pulley or sheave **212**. The fixed block shown in FIGS. **10**A and **10**B is similar to the fixed block **200** shown in FIGS. **3**A and **3**B. The fixed block **200** shown in FIGS. **10**A and **10**B includes a guard **1010** attached to the frame. The guard **1010** prevents line or rope **150** from entering the gap **1020** between the knurled surface **216** and the sheave or pulley **212** and the housing **200**. The guard **1010** can also be termed a guide that guides the line **150** from entering the gap **1020**. The guard **1010**, in one embodiment is a metal plate that is welded or otherwise attached to a corner of the housing. The corner is selected so that it prevents the line **150** from entering the gap **1020** when the line is being placed in a locking position with the line pinched between the widened edge **216** and the top inside portion of the housing **200**. It is recognized that as the block and tackle is used, the line **150** will wear and have to be replaced. If a user replaces the line **150** with a smaller diameter line and uses the block and tackle as intended, the smaller line may be more prone to jamming in the gap **1020**.

It should be noted that the number of sheaves is not limited to two sheaves in the fixed block and two sheaves in the moving block. By increasing the sheaves, the amount of mechanical advantage is increased. More line is needed with an increased number of sheaves in the fixed block or the moving block.

It should also be noted that the invention is not required to be used as a block and tackle. FIG. **6** shows a pulley **600** that incorporates the invention. The pulley **600** includes a housing **610**. A sheave **611** rotates about an axle **614**. The axle is attached to the housing **610**. The sheave **611** has a widened edge **616**. The sheave also has an opening therein that is off

center so that the clearance distance between edge of the sheave **611** and the edge **616** varies with respect to the housing **610**. The pulley **600** includes a line **650**. One end of the line is attached to a load. The line **650** is also threaded through the sheave **611**. The free end of the line can be pulled to apply a force to the load. Moving the line to the side of the sheave having the widened edge **616** and then slowly lowering the load slightly will cause the line **650** to be pinched or caught between the widened edge **616** and the housing **610**. The widened edge **616** can be treated to increase friction, such as by knurling the surface **616**. Releasing the line **650** is accomplished by applying a force to the line **650** to dislodge the line **650** from the position where it is pinched or caught. The line **650** can then be placed in the sheave **611** to move the load using the pulley **600**. In another embodiment, the sheave **611** could be provided with centered opening about which to rotate and a cam could be placed adjacent the sheave **611**. Operation of the pulley would be the same.

In summary, a block and tackle includes a housing for one of a fixed block and a moving block, an axle attached to the housing, and a sheave. The sheave includes a widened edge. The sheave has an opening therein which is off center so that the clearance distance between the edge of the sheave and the housing varies as the sheave rotates. The sheave is rotatably attached to the axle. A line passes over the sheave. The line has a free end. The line has a diameter that is larger than the minimum clearance distance between the edge of the sheave and the housing. The line is movable between a first position in the sheave and a second position over the widened edge of the sheave. In one embodiment, the sheave and the widened edge are formed from a single piece of material. The material can be metal or any other suitable material for a particular application as a block and tackle. In some embodiments, the widened edge is provided with a surface treatment to increase friction. The surface treatment in one embodiment includes knurling. The line has a diameter which is slightly less than a distance across the sheave. In one embodiment, the axle is placed at a distance from the top of the housing such that the minimum clearance between the widened edge and the housing is small enough to prevent the movement of the widened edge and the sheave when the line is placed on the widened edge. The movement is prevented when the clearance is at or near the minimum clearance distance. Movement of the sheave is not prevented at all points where the line is placed on the widened edge.

The invention also contemplates a pulley includes a housing, an axle attached to the housing, and a sheave. The sheave further includes a widened edge. The sheave has an opening therein which is off center so that the clearance distance between the edge of the sheave and the housing varies as the sheave rotates. The sheave is rotatably attached to the axle. The pulley also includes a line passing over the sheave. The line has a free end. The line has a diameter that is larger than the minimum clearance distance between the edge of the sheave and the housing. The line is movable between a first position in the sheave and a second position over the widened edge of the sheave. In one embodiment, the sheave and the widened edge are formed from a single piece of material. The material can be metal or any other suitable material for a particular application as a block and tackle. In some embodiments, the widened edge is provided with a surface treatment to increase friction. The surface treatment in one embodiment includes knurling. The line has a diameter which is slightly less than a distance across the sheave. In one embodiment, the axle is placed at a distance from the top of the housing such that the minimum clearance between the widened edge and the housing is small enough to prevent the movement of the widened edge and the sheave when the line is placed on the widened edge. The movement is prevented when the clearance is at or near the minimum clearance distance. Movement of the sheave is not prevented at all points where the line is placed on the widened edge.

The invention also includes a lifting mechanism that includes a housing, an axle attached to the housing, and an element including a cam surface mounted for rotation on the axle. The distance between the cam surface and the housing changes between a maximum clearance distance and a minimum clearance distance as the element rotates about the axle. The lifting mechanism also includes a line which can be moved between a first position over the cam surface and a second position. In one embodiment, the cam surface includes a surface treatment for increasing an amount of friction at the cam surface. In another embodiment, the cam surface is associated with a cam and in still another embodiment, the cam surface is associated with a round element that includes an off center opening. The round element is rotatably mounted to the axis via the off center opening. In still a further embodiment, the lifting mechanism also includes a sheave mounted to the axle. The cam surface and the sheave can be formed from a single piece of material. The cam surface and the sheave can also be separate elements. In one embodiment, the line is in the second position when it is positioned within the sheave. The lifting mechanism, in one embodiment, is made from a metal.

The lifting mechanisms discussed above all operate in much the same manner. Namely, the line is used to lift or move a load. The line can be moved to a cam surface which can be a cam or a round surface mounted off center. The line is released to lower the load and when the line is on the cam surface it catches or is gripped as the cam surface goes toward the position with respect to the housing where the clearance distance is minimum. The load can be held without having to tie off the free end of the line. Of course, some users are cautious and would also tie off the line. The line can be released by tugging or applying a force to the line to lift or move the load. The line is moved to a second position off the camming surface. In some embodiments, this is a position within a sheave. When in the sheave, the lifting mechanism can be operated without the line catching or interfering with the housing. The lifting mechanism can be a block and tackle or can be a pulley.

The same mechanism can be used in situations where there is a substantial horizontal component of force to overcome. In these situations, the mechanism will lock a rope, line or cord in place even though the force may include a substantial portion which is not due to gravity. The mechanism can therefore be termed a locking mechanism which can be used to overcome the force of gravity or other forces that include a substantial horizontal component. The locking mechanism can hold a rope, line or cord when any force is present resulting in tension on the line, rope or cord. The tension force can be due to gravity, another vertical force, or a horizontal force, or a mixture of vertical and horizontal forces. The locking mechanism will hold the line, rope or cord in each instance. The locking mechanism includes a housing and an axle attached to the housing, and a sheave that is attached to the axle so that the sheave rotates with respect to the housing. The sheave has a widened edge. In one embodiment, the sheave has an opening therein which is off center so that a clearance distance between the edge of the sheave and the housing varies between a minimum and maximum clearance distance as the sheave rotates. The locking mechanism also includes a line. The line has a diameter that is smaller than the maximum clearance distance and larger than the minimum clearance

distance. The line passes over the sheave. The line is movable between a first position in the sheave and a second position over the widened edge of the sheave. The line is brought into a locking position as tension is applied to one end of the line when the line is brought into the second position. After the line is brought to a second position over the widened portion of the sheave, the counterforce on the line is released allowing the line to be pinched or gripped between the widened edge and the housing. Releasing the line is accomplished by pulling the free end to move the pulley or sheave in a direction away from the housing. The line can then be moved onto the sheave and the locking mechanism can be used as a pulley alone or as part of a block and tackle. The widened edge can be provided with a surface treatment to roughen the surface and increase the friction between the line and the widened edge. In another embodiment, the housing portion that grips or pinches the rope can also be provided with features or a surface treatment for increasing the friction on the line. In one embodiment, both the housing and the widened edge are provided with a surface treatment. One surface treatment can include knurling. In another embodiment, one or both of the housing and the widened edge can be provided with features, such as ridges, for enhancing the ability of the widened edge or housing to grip the line. In some embodiments, these could be cast or machined into the housing or widened edge. In other embodiments, one of the housing or the widened edge is provided with a first surface treatment and the other is provided with a second surface treatment or set of features.

As discussed above, the sheave is provided with an opening that receives an axle. FIG. **7** shows another example embodiment in which an axle **714** is attached to the pulley or sheave **711** at a location offset from a central axis **760**. As shown, the axle **714** can be mounted directly to the sheave **711** and then the sheave and axle assembly can rotate within a set of openings in the housing. The sheave **711** also includes a widened edge **716**.

The lifting mechanism or locking mechanism has wide application. This can be used by outdoorsman to hoist big game, or by a homeowner wanting to store items near the ceiling of a garage. These are but two examples. The number of uses is seemingly endless. This device is especially helpful to a weaker user who would have trouble tying off a free end of a line while maintaining tension in the free end. Other uses include: a flower pot hanger, a rifle and bow hoist, a tree stand hoist, an RV (recreational vehicle) tie-down, an aircraft tie-down, an extension ladder assembly, an automatic big game feeder (to raise and lower the feeder), a birdhouse (raising and lowering), sailboat rigging, a boat anchor, a venetian blind, a painter/window washer hoist, a backpack tie-down, rock climbing gear, a tarp tie-down, a camping tent tie-down, and for farm gear, such as for a barb wire fence stretcher. Of course, this list is not exhaustive as there are many more uses for the lifting mechanism or locking mechanism discussed in detail above.

This has been a detailed description of some exemplary embodiments of the invention(s) contained within the disclosed subject matter. Such invention(s) may be referred to, individually and/or collectively, herein by the term "invention" merely for convenience and without intending to limit the scope of this application to any single invention or inventive concept if more than one is in fact disclosed. The detailed description refers to the accompanying drawings that form a part hereof and which shows by way of illustration, but not of limitation, some specific embodiments of the invention, including a preferred embodiment. These embodiments are described in sufficient detail to enable those of ordinary skill in the art to understand and implement the inventive subject matter. Other embodiments may be utilized and changes may be made without departing from the scope of the inventive subject matter. Thus, although specific embodiments have been illustrated and described herein, any arrangement calculated to achieve the same purpose may be substituted for the specific embodiments shown. This disclosure is intended to cover any and all adaptations or variations of various embodiments. Combinations of the above embodiments, and other embodiments not specifically described herein, will be apparent to those of skill in the art upon reviewing the above description.

I claim:

1. A pulley comprising:

a housing;

an axle attached to the housing;

a sheave, the sheave further comprising a widened edge, the sheave having an opening therein which is off center so that a clearance distance between the widened edge of the sheave and the housing varies as the sheave rotates, the sheave rotatably attached to the axle; and

a line passing over the sheave having a free end, the line having a diameter that is larger than a minimum clearance distance between the widened edge of the sheave and the housing, the line being movable between a first position in the sheave and a second position over the widened edge of the sheave.

2. The pulley of claim **1** wherein the axle defines a rotation axis for the sheave, the widened edge having a circular cross section in a plane perpendicular to the rotation axis, and the axle and the rotation axis being offset from a geometric center of the widened edge.

3. The pulley of claim **1** wherein the widened edge is provided with a surface treatment to increase friction.

4. The pulley of claim **1** wherein the widened edge includes a knurled surface.

5. The pulley of claim **1** wherein the line has a diameter which is slightly less than a distance across the sheave.

6. The pulley of claim **1** wherein the axle is placed at a distance from a top of the housing such that the minimum clearance between the widened edge and the housing is small enough to prevent the movement of the widened edge and the sheave when the line is placed on the widened edge.

7. A lifting mechanism comprising:

a housing;

an axle attached to the housing and defining a rotation axis;

a round element including a cam surface and an off center opening, the round element being mounted to the axle via the off center opening and being rotatable about the rotation axis relative to the housing, a distance between the cam surface and the housing changing between a maximum clearance distance and a minimum clearance distance as the element rotates about the rotation axis, wherein the cam surface has a circular cross-section in a plane perpendicular to the rotation axis; and

a line which can be moved between a first position over the cam surface and a second position.

8. The lifting mechanism of claim **7** wherein the cam surface includes a surface treatment for increasing an amount of friction at the cam surface.

9. The lifting mechanism of claim **7** further comprising a sheave mounted to the axle.

10. The lifting mechanism of claim **9** wherein the cam surface and the sheave are formed from a single piece of material.

11. The lifting mechanism of claim **9** wherein the line is in the second position when it is positioned within the sheave.

12. The lifting mechanism of claim 7 wherein the lifting mechanism is made from a metal.

13. A locking mechanism comprising:

a housing;

an axle attached to the housing;

a sheave, the sheave further comprising a widened edge, the sheave having an opening therein which is off center so that a clearance distance between the edge of the sheave and the housing varies between a minimum and maximum clearance distance as the sheave rotates, the sheave rotatably attached to the axle; and

a line passing over the sheave, the line having a diameter that is smaller than the maximum clearance distance and larger than the minimum clearance distance, the line movable between a first position in the sheave and a second position over the widened edge of the sheave, wherein the line is brought into a locking position as tension is applied to one end of the line when the line is brought into the second position.

14. The locking mechanism of claim 13 wherein the sheave and the widened edge are formed from a single piece of material.

15. The locking mechanism of claim 13 wherein the widened edge is provided with a surface treatment to increase friction.

16. The locking mechanism of claim 13 wherein the widened edge includes a knurled surface.

17. The locking mechanism of claim 13 wherein the line has a diameter which is slightly less than a distance across the sheave.

18. The locking mechanism of claim 13 wherein the axle is placed at a distance from a top of the housing such that the minimum clearance between the widened edge and the housing is small enough to prevent the movement of the widened edge and the sheave when the line is placed on the widened edge.

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